

FIGURE 1

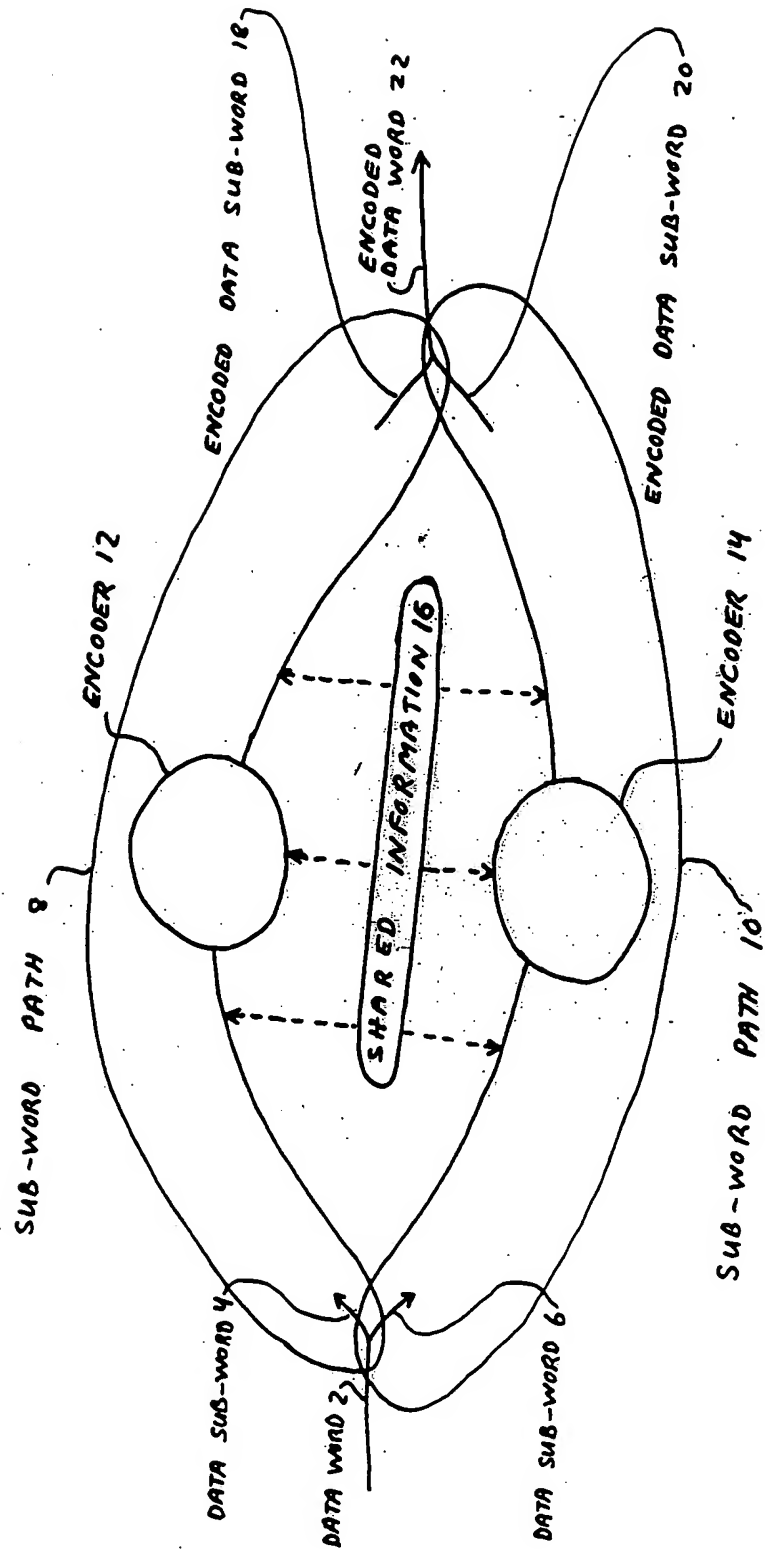
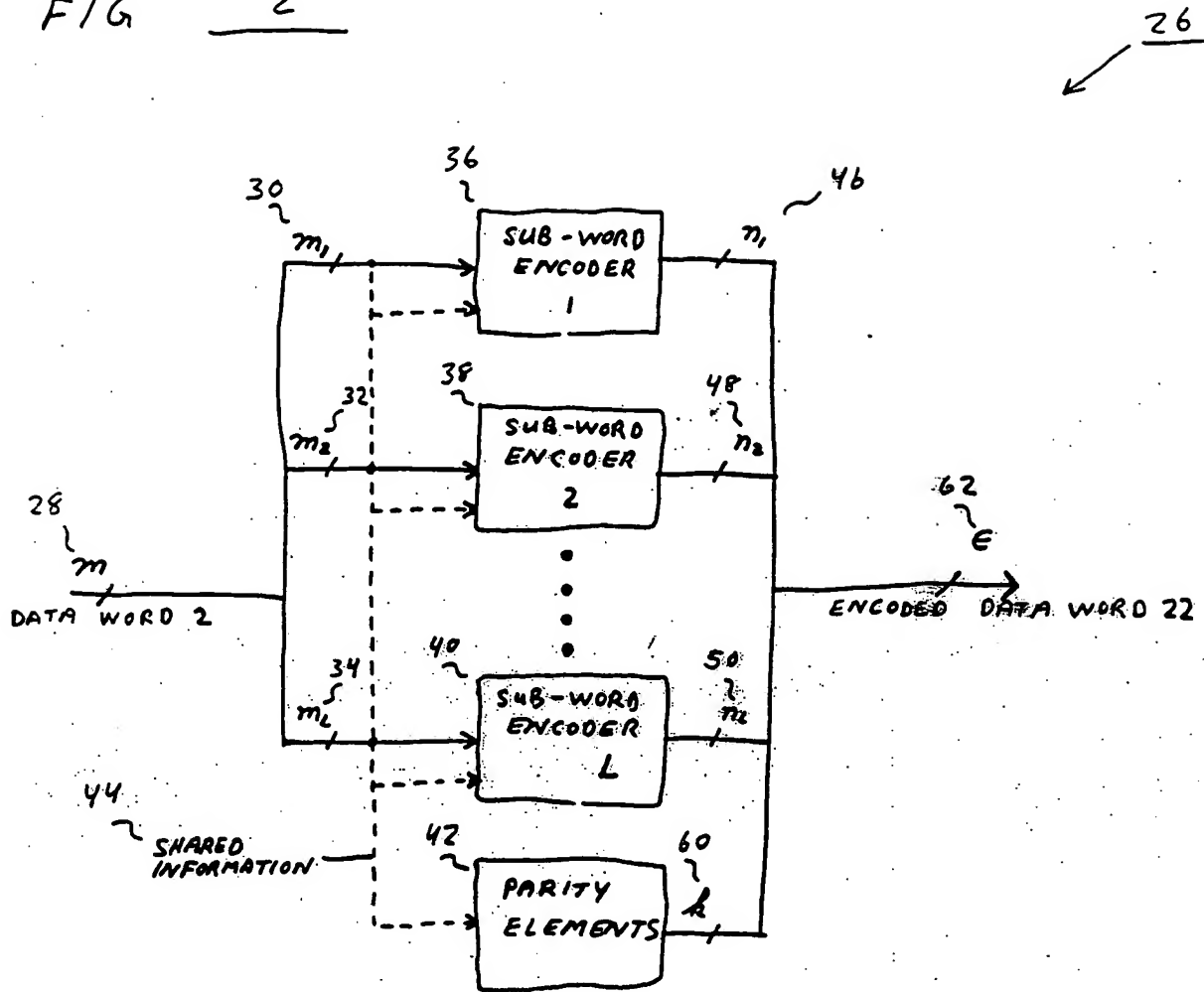


FIG 2



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$$E = (n_1) + (n_2) + \dots + (n_L) + k$$

and $n_1 > m_1, n_2 > m_2, \dots, n_L > m_L$

FIGURE 3

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NUMBER OF ENCODED LINES (n)	NUMBER OF ONES (P) IN AN ENCODED WORD										
	P=0	P=1	P=2	P=3	P=4	P=5	P=6	P=7	P=8	P=9	P=10
n=1	1.	1.									
n=2	1.	2.	1.								
n=3	1.	3.	3.	1.							
n=4	1.	4.	6.	4.	1.						
n=5	1.	5.	10.	10.	5.	1.					
n=6	1.	6.	15.	20.	15.	6.	1.				
n=7	1.	7.	21.	35.	35.	21.	7.	1.			
n=8	1.	8.	28.	56.	70.	56.	28.	8.	1.		
n=9	1.	9.	36.	84.	126.	126.	84.	36.	9.	1.	
n=10	1.	10.	45.	120.	210.	252.	210.	120.	45.	10.	1.

FIGURE 4

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ENCODED WORD LENGTH	Code States	INPUT Word LENGTH	Extra Lines
3	2	1	2
4	6	2	2
5	10	3	2
6	20	4	2
7	35	5	2
8	70	6	2
9	126	6	3
10	252	7	3
11	462	8	3
12	924	9	3
13	1716	10	3
14	3432	11	3
15	6435	12	3
16	12870	13	3
17	24310	14	3
18	48620	15	3
19	92378	16	3
20	184756	17	3
21	352716	18	3

FIG 5

70

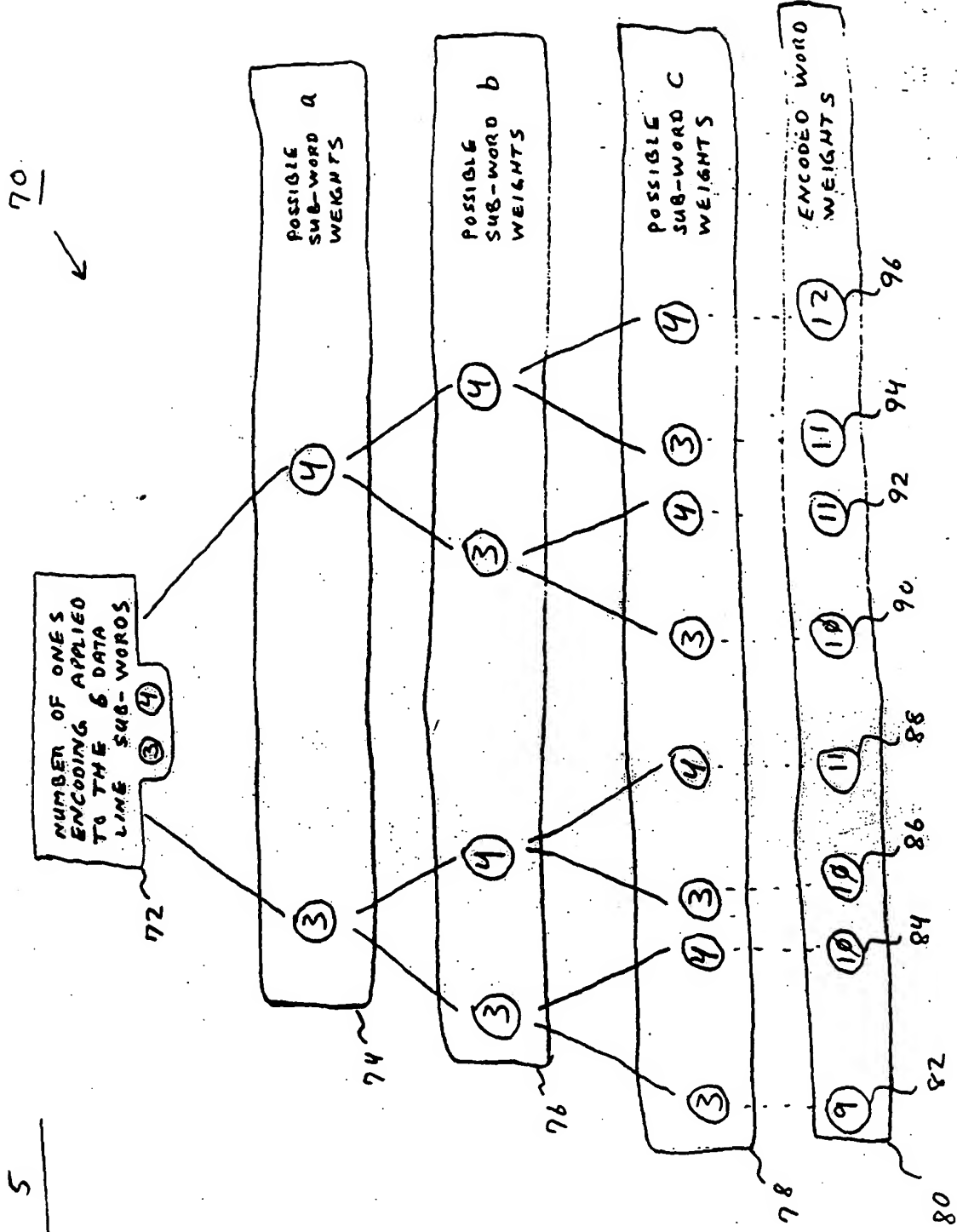


FIG 6

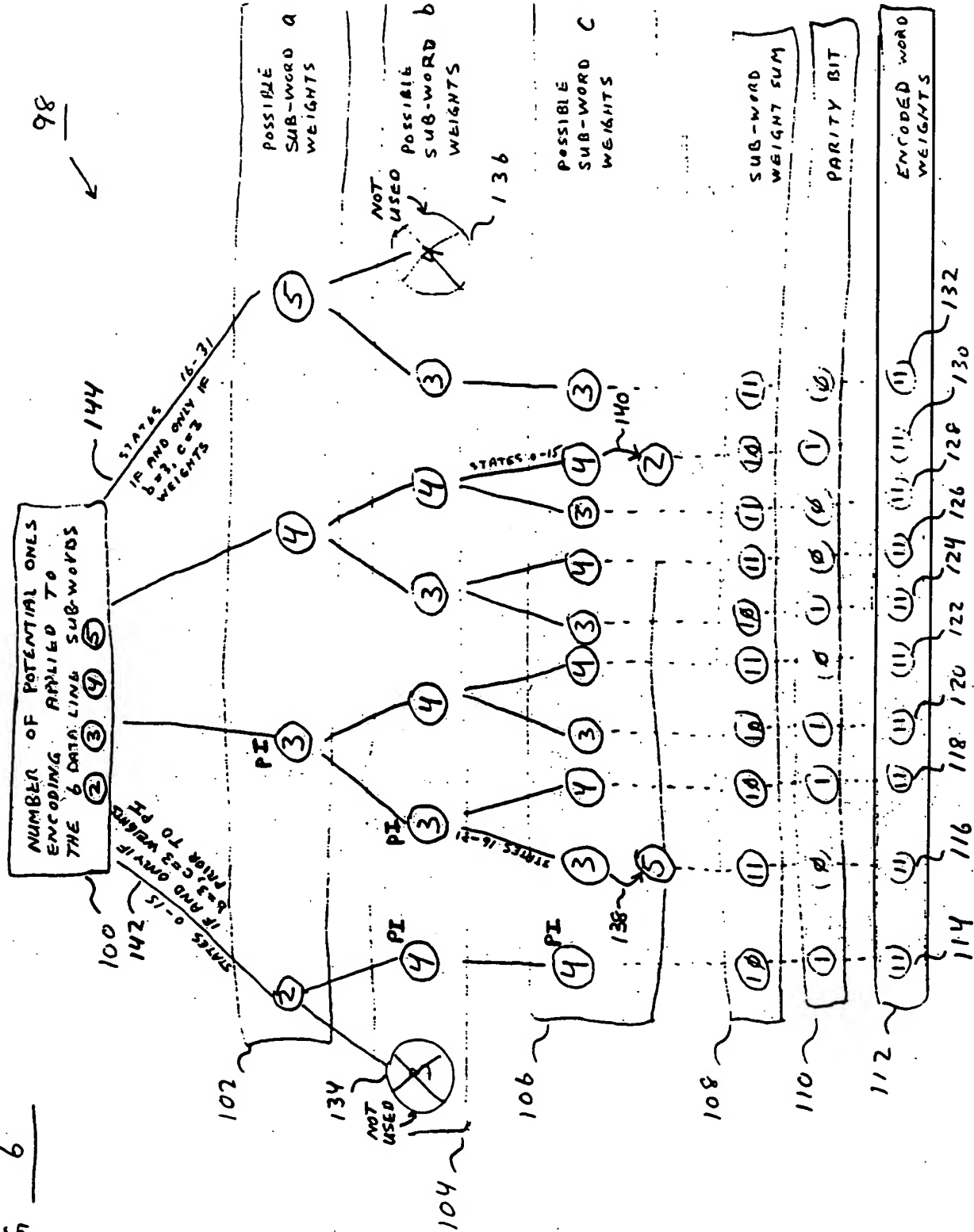
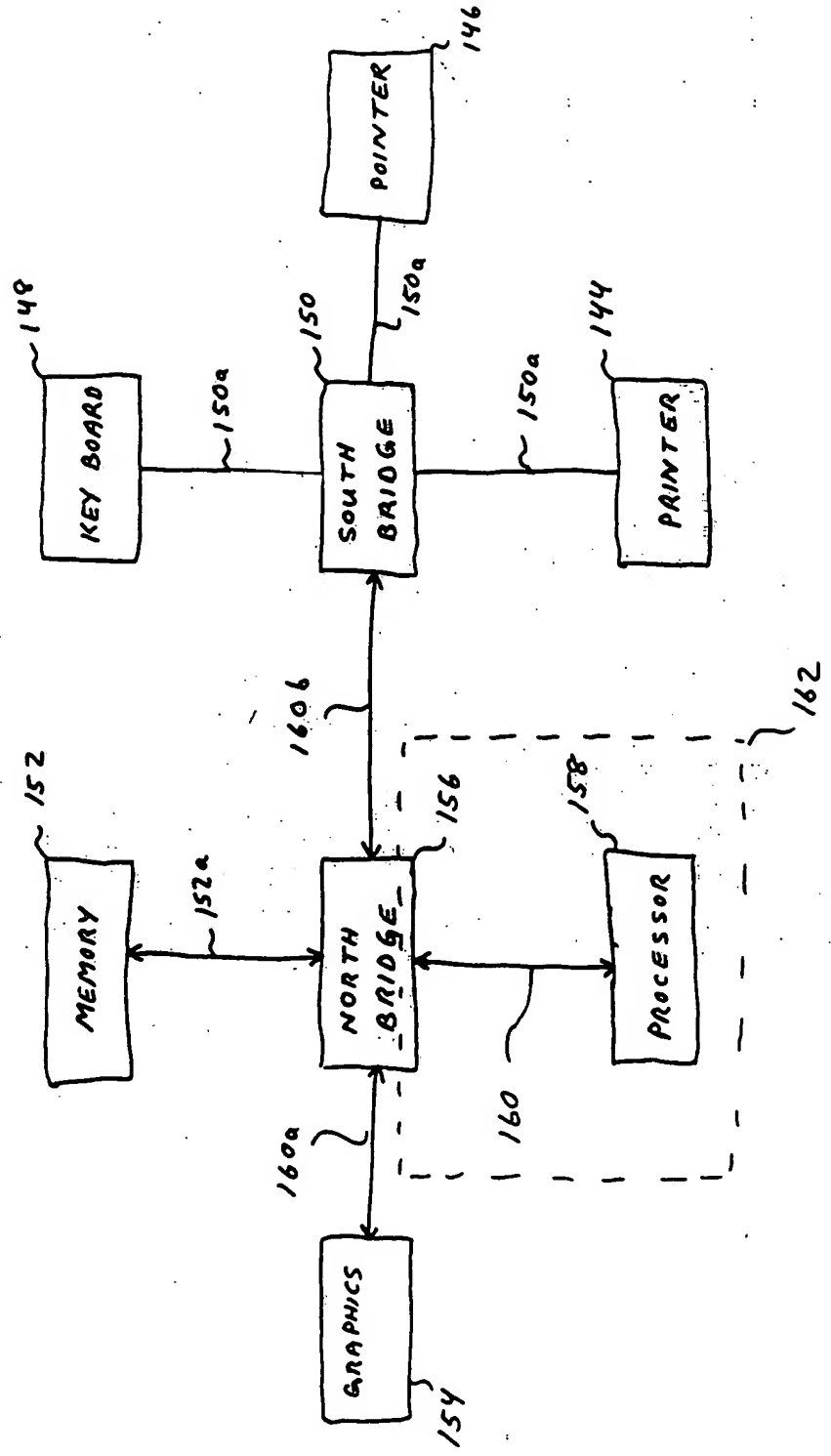


FIGURE 7



142

FIGURE 8

162

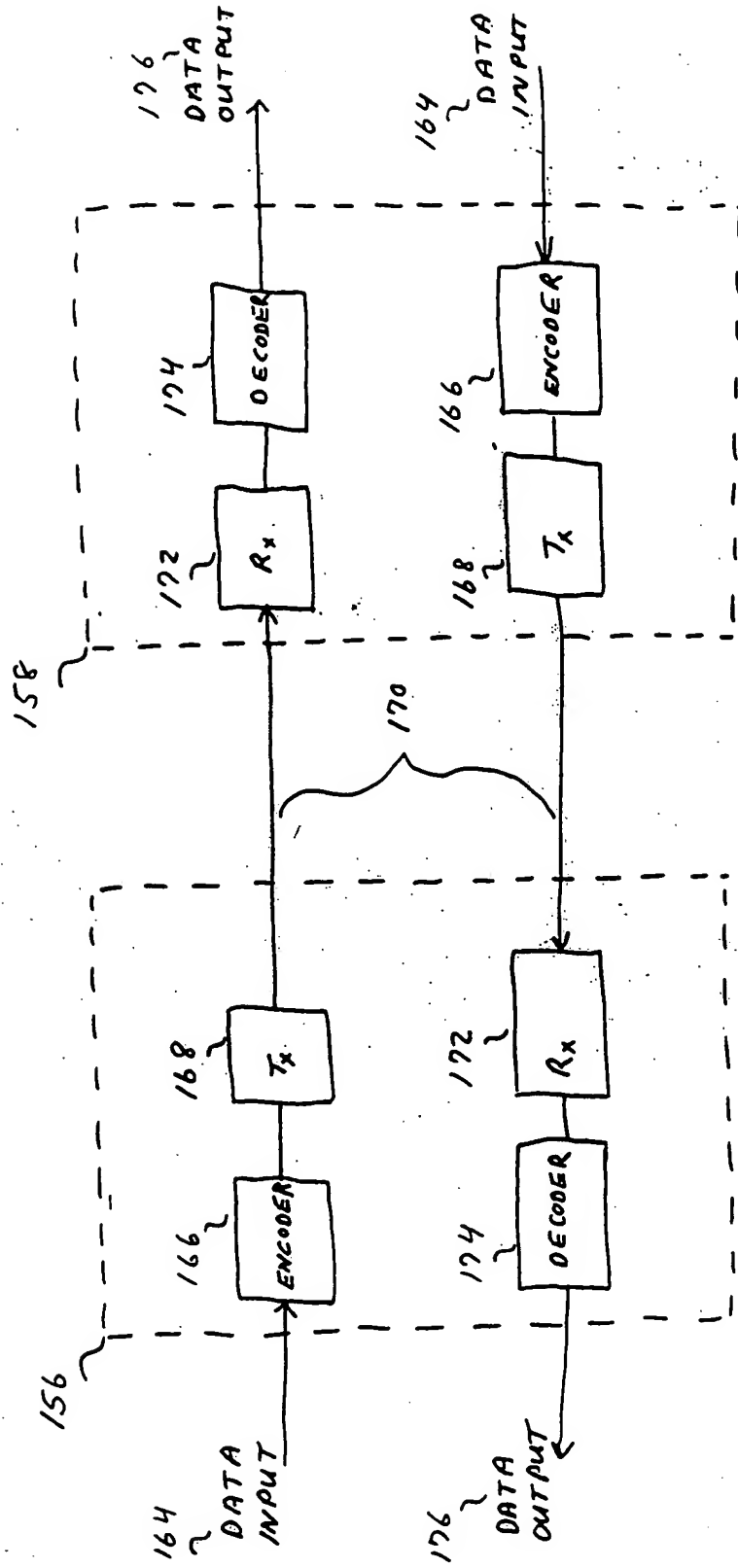


FIGURE 9

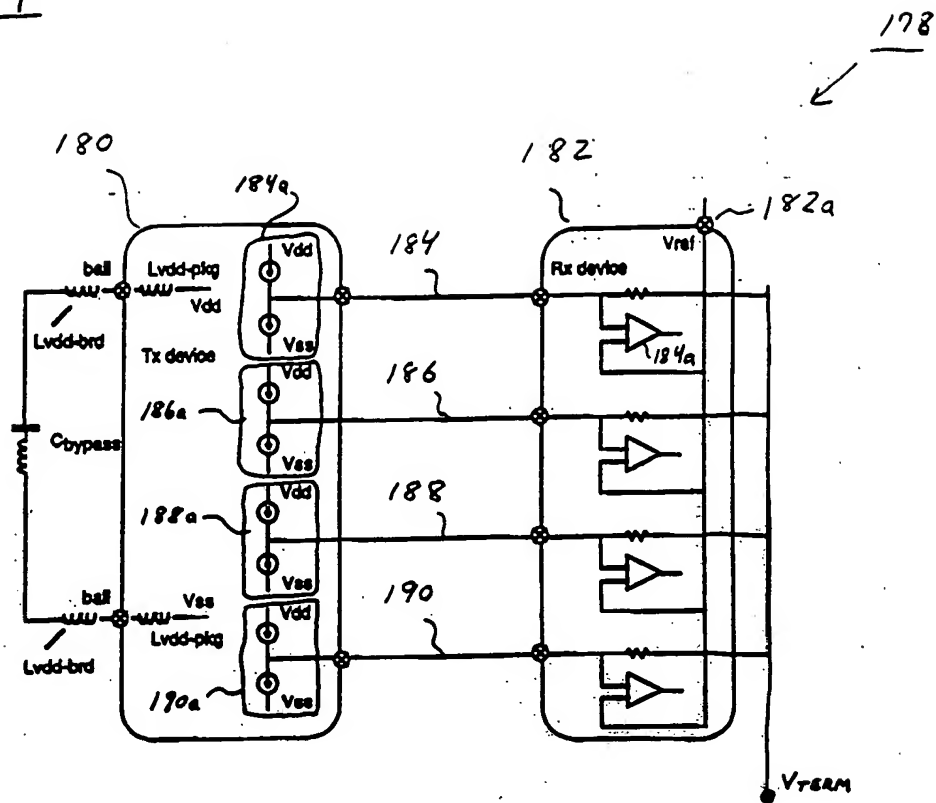
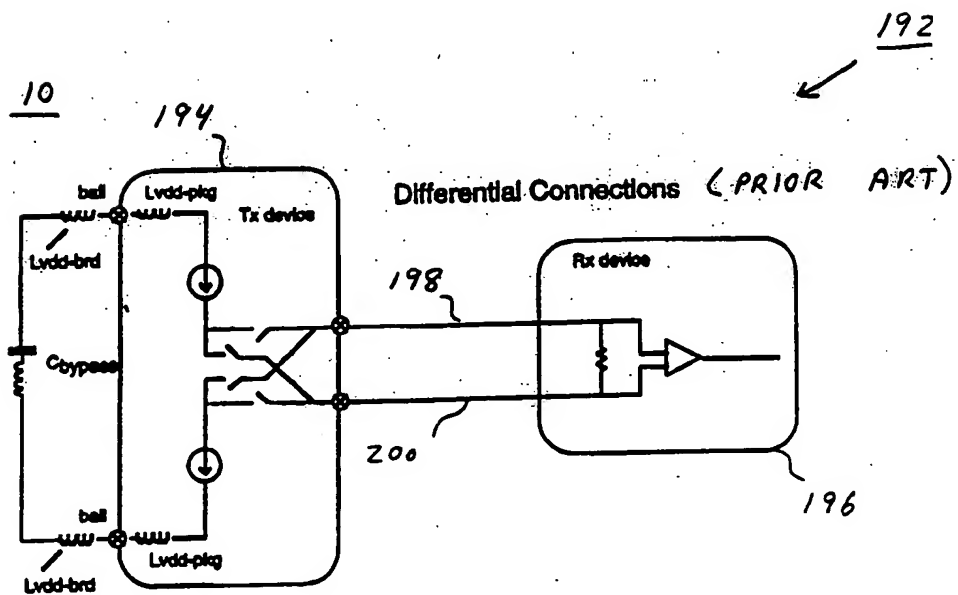


FIGURE 10



Top-level block diagram for the encoder

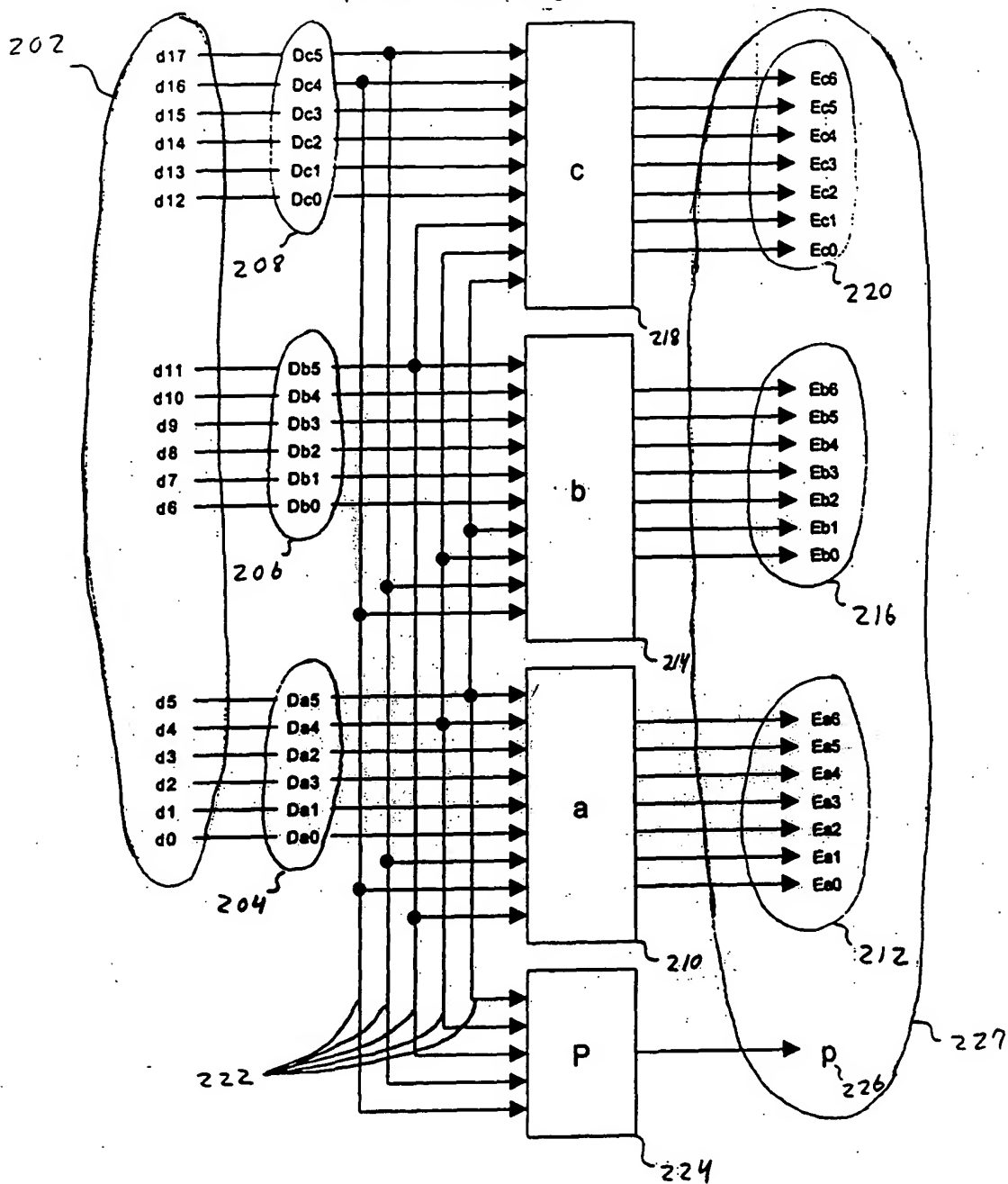


FIG 12

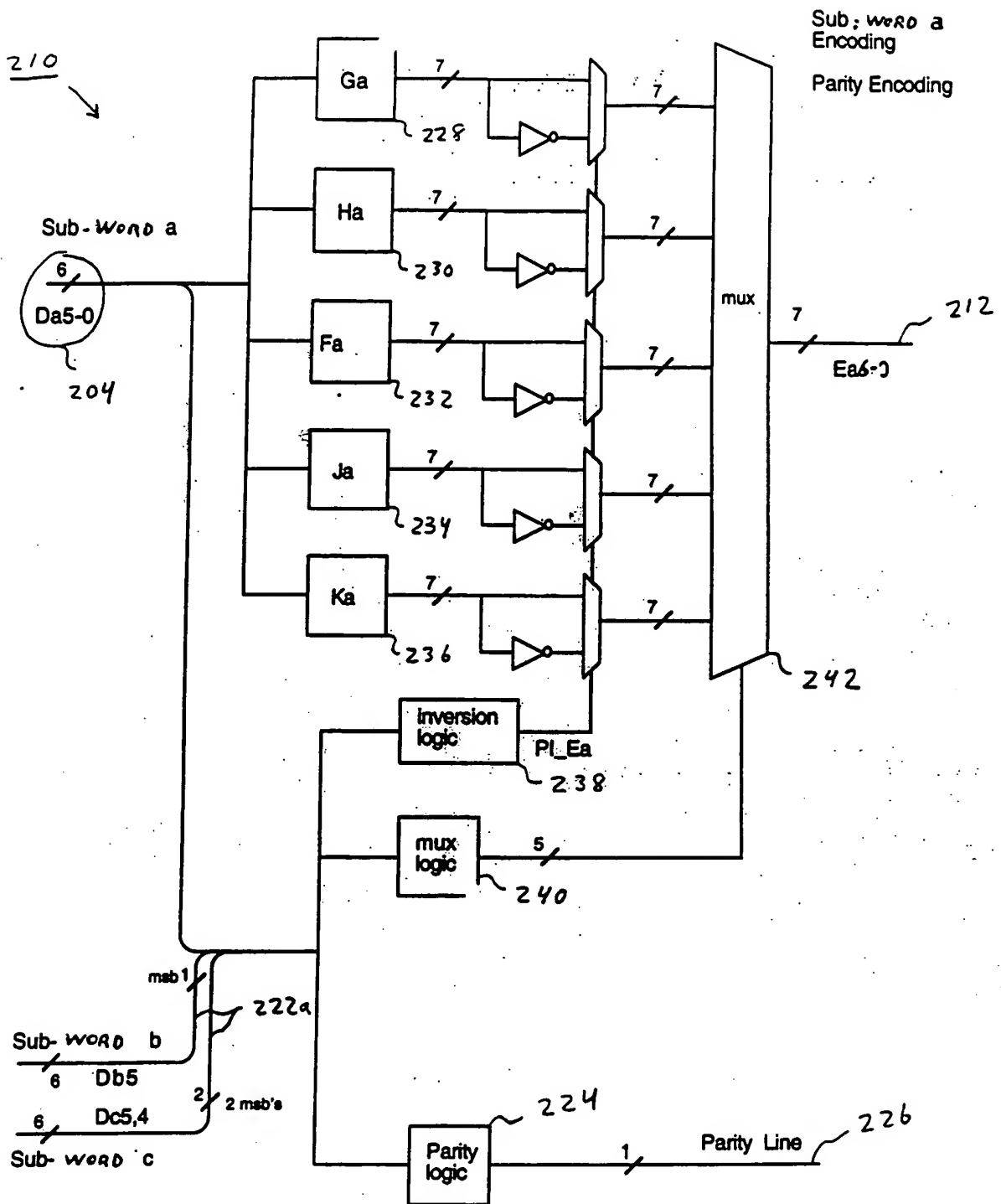


FIG 13

Encode Truth tables for Block diagram elements of SAb - word a.

240a

Subchannel a Mux Truth Table					
Da5	Da4	Da3	Da2	Da1 + Da5	Block
0	0	0	x		G
0	0	0	0	1	G
0	0	0	1	1	F1
0	0	1	x		J
0	1	0	x	0	K
0	1	0	x	1	J
0	1	1	x	0	H
0	1	1	x	1	K
1	0	0	x	x	J
1	0	1	x	x	K
1	1	0	x	x	K
1	1	1	0	x	P2
1	1	1	1	x	H

238a

Subch. a Post Inversion Truth Table	
Da5-Da4-Da3-Da2	P1 P2
0	no inversion
1	invert

224a

Truth Table for Parity Bit					
Da5	Da4	Da3	Da2	Da1	Parity Bit
0	0	0	0	x	1
1	0	0	0	x	0
x	0	0	1	x	1
x	0	1	0	x	1
x	0	1	1	x	0
x	1	0	0	x	1
x	1	0	1	x	0
x	1	1	0	x	0
x	1	1	1	0	1
x	1	1	1	1	0

228a

Block Ga		
Da1	Da0	Est-0
0	0	10000
0	1	01000
1	0	00100
1	1	00010

Block Ma		
Da1	Da0	Est-0
0	0	11101
0	1	11011
1	0	10111
1	1	01111

230a

Da5 + Da3	Da2	Est	Est
0	0	0	1
0	1	1	0
1	x	0	0

Block Pa		
Da1	Da0	Est-0
0	0	11000
0	1	10100
1	0	01011
1	1	00111

232a

234a

Block Ja			
Da2	Da1	Da0	Est-0
0	0	0	10010
0	0	1	10001
0	1	0	01100
0	1	1	01010
1	0	0	01001
1	0	1	00110
1	1	0	00101
1	1	1	00011

Block Ka			
Da2	Da1	Da0	Est-0
0	0	0	11100
0	0	1	11010
0	1	0	11001
0	1	1	10110
1	0	0	10101
1	0	1	10011
1	1	0	01110
1	1	1	01101

236a

FIG 14

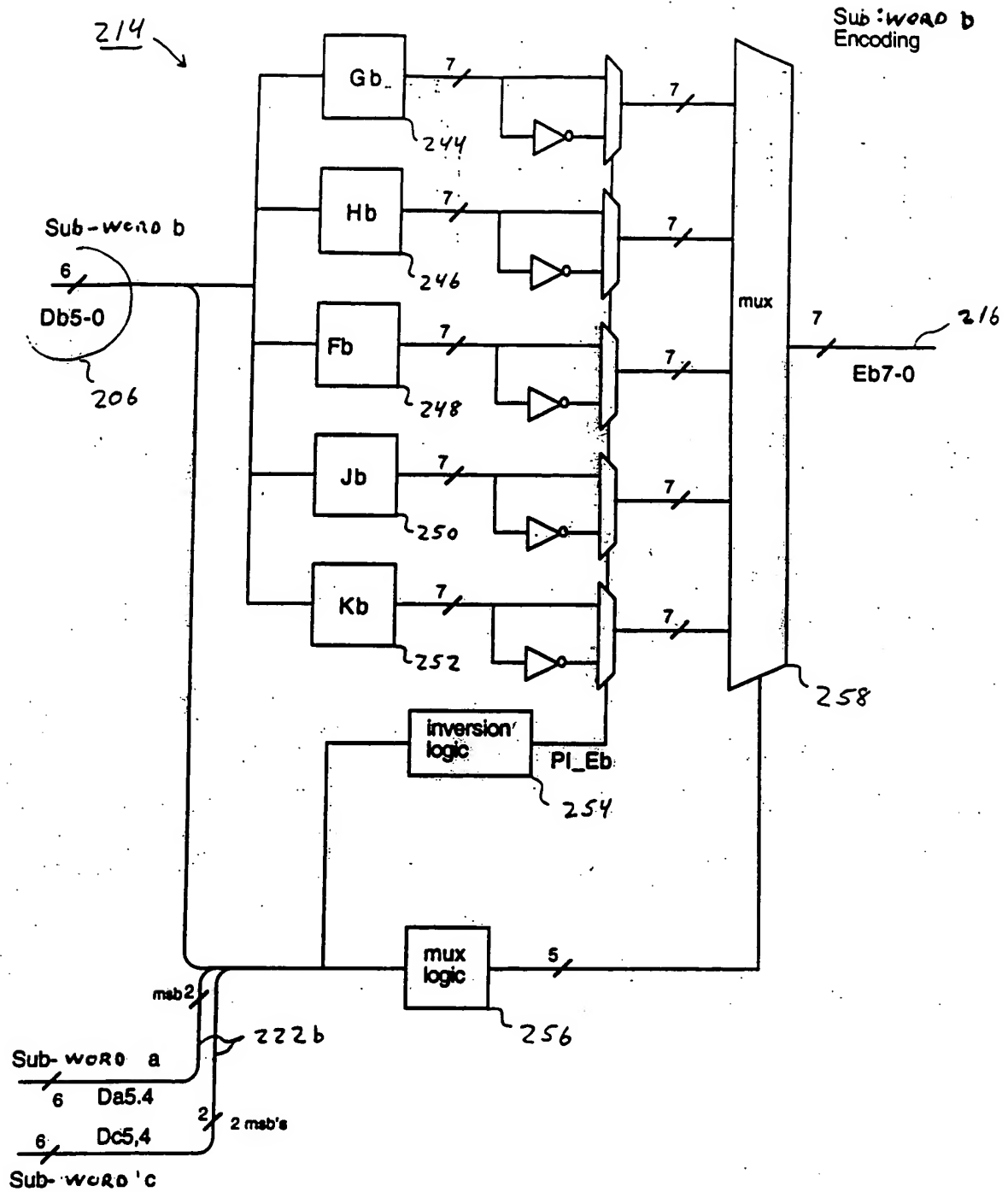


FIG 15

Encode Truth tables for Block diagram elements of sub-WVD 250b

256b

Subchannel b Mux Truth Table					Block
Db5	Db4	Db3	Db2		
0	0	0	0		G
0	0	0	1		F1
0	0	1	x		J
0	1	0	x		J
0	1	1	x		K
1	0	0	x		J
1	0	1	x		K
1	1	0	x		K
1	1	1	0		F2
1	1	1	1		H

254b

Subchannel b Post Inversion Truth Table					Pl Eb
De4	De5	Db5	De5	De4	
0	0	0	0	x	Invert
all other combinations					no inversion
x	1	1	1	1	Invert

244b

Block Gb		
Db1	Db0	Eb4-0
0	0	10000
0	1	01000
1	0	00100
1	1	00010
		Eb6 Eb5
always 1 for Gb		1 1

Block Hb		
Db1	Db0	Eb4-0
0	0	11101
0	1	11011
1	0	10111
1	1	01111
		Eb6 Eb5
always 0 for Hb		0 0

246b

Block Fb		
Db1	Db0	Eb4-0
0	0	11000
0	1	10100
1	0	01011
1	1	00111
Db2	Db1	Eb6 Eb5
x	0	1
x	1	0
0	x	1
1	x	0

248b

250b

Block Jb			
Db2	Db1	Db0	Eb4-0
0	0	0	10010
0	0	1	10001
0	1	0	01100
0	1	1	01010
1	0	0	01001
1	0	1	00110
1	1	0	00101
1	1	1	00011
Db4	Db3	Eb6	Eb5
x	0		1
x	1		0
0	x	1	
1	x	0	

Block Kb			
Db2	Db1	Db0	Eb4-0
0	0	0	11100
0	0	1	11010
0	1	0	11001
0	1	1	10110
1	0	0	10101
1	0	1	10011
1	1	0	01110
1	1	1	01101
Db4	Db3	Eb6	Eb5
x	0		0
x	1		1
0	x	1	
1	x	0	

252b

FIG 16

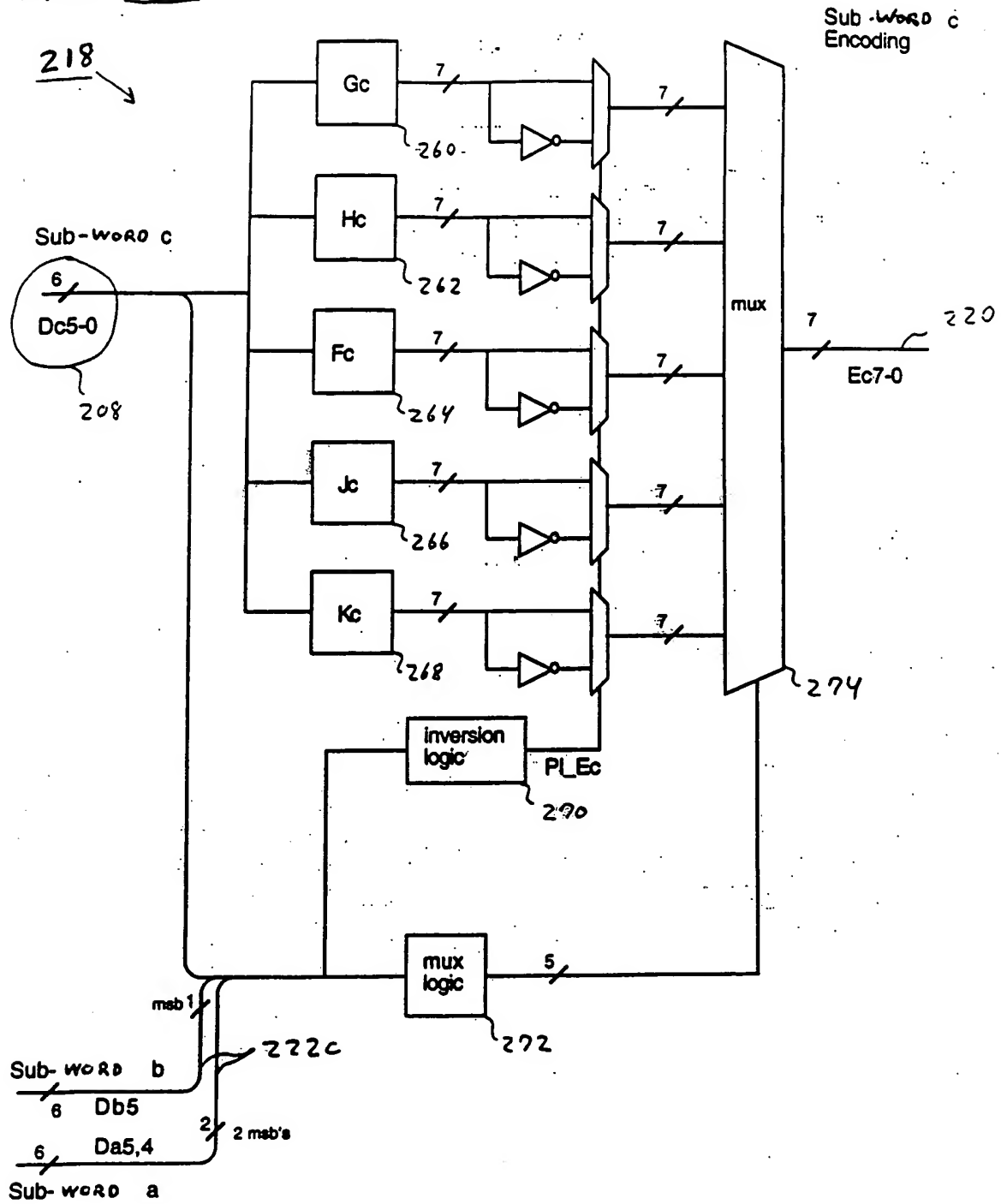


FIG 17

Encode Truth tables for Block diagram elements of sub-word c

Subchannel c Mux Truth Table					
Dc5	Dc4	Dc3	Dc2	Da5-Db5	Block
0	0	0	0	x	G
0	0	0	1	x	F1
0	0	1	x	x	J
0	1	0	x	x	J
0	1	1	x	x	K
1	0	0	x	0	J
1	0	0	x	1	G
1	0	1	x	0	K
1	0	1	x	1	J
1	1	0	x	x	K
1	1	1	0	0	F2
1	1	1	1	0	H
1	1	1	1	1	H

Subch. c Post Inversion Truth Table	
Da4-Da5-Db5-Dc5	Pl Ec
0	Invert
1	no Inversion

Block Gc			
Dc1	Dc0	Ec4-0	
0	0	10000	
0	1	01000	
1	0	00100	
1	1	00010	
Dc5	Dc2	Ec6	Ec5
0	0	1	1
1	0	0	1
1	1	1	0

Block Hc			
Dc1	Dc0	Ec4-0	
0	0	11101	
0	1	11011	
1	0	10111	
1	1	01111	

Da5-Db5	Dc2	Ec6	Ec5
0	x	0	0
1	0	0	1
1	1	1	0

Block Fc			
Dc1	Dc0	Ec4-0	
0	0	11000	
0	1	10100	
1	0	01011	
1	1	00111	
Dc2	Dc1	Ec6	Ec5
x	0	1	
x	1	0	
0	x		1
1	x		0

Block Jc				
Dc2	Dc1	Dc0	Ec4-0	
0	0	0	10010	
0	0	1	10001	
0	1	0	01100	
0	1	1	01010	
1	0	0	01001	
1	0	1	00110	
1	1	0	00101	
1	1	1	00011	

Dc5	Dc3	Ec6	Ec5
		0	1
		1	0
0		0	0
0		1	1
1		0	1
1		1	0

Block Kc				
Dc2	Dc1	Dc0	Ec4-0	
0	0	0	11100	
0	0	1	11010	
0	1	0	11001	
0	1	1	10110	
1	0	0	10101	
1	0	1	10011	
1	1	0	01110	
1	1	1	01101	

Da5-Db5	Dc4	Dc3	Ec6	Ec5
0		x	0	0
0		x	1	1
0		0	x	1
0		1	x	0
1		x	x	1

272c

270c

262c

264c

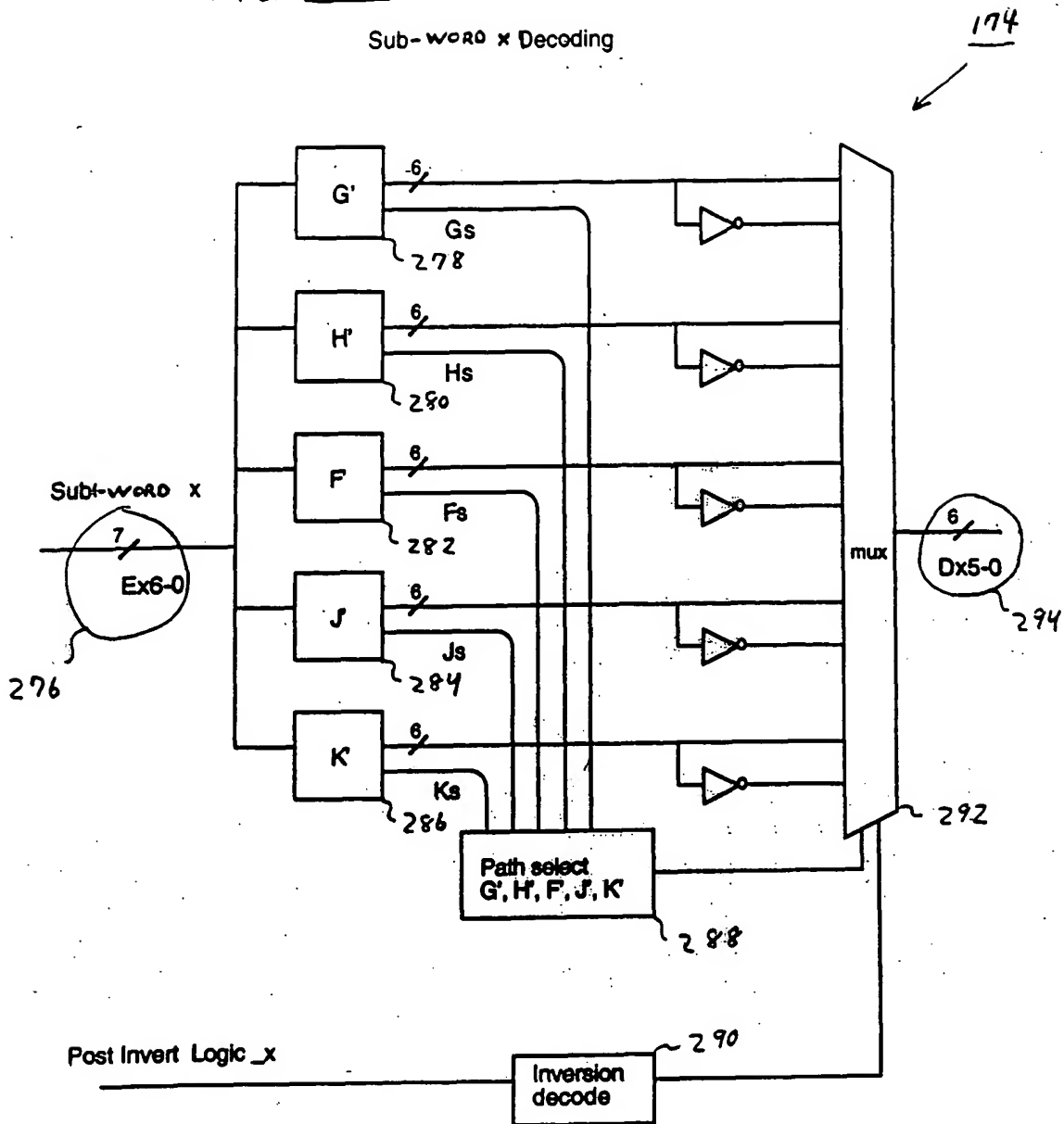
260c

266c

268c

FIG 18

Sub-word x Decoding



note: x is a, b, or c for respective sub-words

FIG 19

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Truth Table for Sub-Word Decode

Decode Mux Truth Table Sub-Word a													
Ea4-0	Decode Path Mux Control					Block	Da5	Da4	Da3	Da2	Da1	Da0	
	Gas	Has	Fas	Jas	Kas								
10000	1	0	0	0	0	G'	0	0	0	Ea5_	0	0	
01000	1	0	0	0	0	G'	0	0	0	Ea5_	0	1	
00100	1	0	0	0	0	G'	0	0	0	Ea5_	1	0	
00010	1	0	0	0	0	G'	0	0	0	Ea5_	1	1	
11101	0	1	0	0	0	H'	Ea6_-Ea5_	1	1	Ea5_	0	0	
11011	0	1	0	0	0	H'	Ea6_-Ea5_	1	1	Ea5_	0	1	
10111	0	1	0	0	0	H'	Ea6_-Ea5_	1	1	Ea5_	1	0	
01111	0	1	0	0	0	H'	Ea6_-Ea5_	1	1	Ea5_	1	1	
11000	0	0	1	0	0	F'	Ea5	Ea5	Ea5	Ea5_	0	0	
10100	0	0	1	0	0	F'	Ea5	Ea5	Ea5	Ea5_	0	1	
01011	0	0	1	0	0	F'	Ea5	Ea5	Ea5	Ea5_	1	0	
00111	0	0	1	0	0	F'	Ea5	Ea5	Ea5	Ea5_	1	1	
10010	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	0	0	0	
10001	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	0	0	1	
01100	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	0	1	0	
01010	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	0	1	1	
01001	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	1	0	0	
00110	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	1	0	1	
00101	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	1	1	0	
00011	0	0	0	1	0	J'	Ea5-Ea6	Ea6_-Ea5	Ea5_	1	1	1	
11100	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	0	0	0	
11010	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	0	0	1	
11001	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	0	1	0	
10110	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	0	1	1	
10101	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	1	0	0	
10011	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	1	0	1	
01110	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	1	1	0	
01101	0	0	0	0	1	K'	Ea6 xor Ea5	Ea6_ + Ea5	Ea5_	1	1	1	

Post Inversion Logic

Invert Results of sub-Word a decode if WSubCh_c=1

INVERT DECODED VALUE FOR
SUB-WORD a IF THE WEIGHT
OF SUB-WORD c EQUALS FIVE

290a

FIG 20

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Decode Mux Truth Table Sub-word b													
Eb4-0	Decode Path Mux Control					Block		Db5	Db4	Db3	Db2	Db1	Db0
	Gbs	Hbs	Fbs	Jbs	Kbs								
10000	1	0	0	0	0	G'		0	0	0	0	0	0
01000	1	0	0	0	0	G'		0	0	0	0	0	1
00100	1	0	0	0	0	G'		0	0	0	0	1	0
00010	1	0	0	0	0	G'		0	0	0	0	1	1
11101	0	1	0	0	0	H'		1	1	1	1	0	0
11011	0	1	0	0	0	H'		1	1	1	1	0	1
10111	0	1	0	0	0	H'		1	1	1	1	1	0
01111	0	1	0	0	0	H'		1	1	1	1	1	1
11000	0	0	1	0	0	F'		Eb5	Eb5	Eb5	Eb5_	0	0
10100	0	0	1	0	0	F'		Eb5	Eb5	Eb5	Eb5_	0	1
01011	0	0	1	0	0	F'		Eb5	Eb5	Eb5	Eb5_	1	0
00111	0	0	1	0	0	F'		Eb5	Eb5	Eb5	Eb5_	1	1
10010	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	0	0	0
10001	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	0	0	1
01100	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	0	1	0
01010	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	0	1	1
01001	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	1	0	0
00110	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	1	0	1
00101	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	1	1	0
00011	0	0	0	1	0	J'		Eb5-Eb6	Eb6_	Eb5_	1	1	1
11100	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	0	0	0
11010	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	0	0	1
11001	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	0	1	0
10110	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	0	1	1
10101	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	1	0	0
10011	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	1	0	1
01110	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	1	1	0
01101	0	0	0	0	1	K'		Eb6 + Eb5	Eb6_	Eb5_	1	1	1

Post Inversion Logic

Invert Results of sub-word b decode if $W5subCh_c + W2subCh_a = 1$

$W5subCh_c = Kcs \cdot Ec6 \cdot Ec5 + Hcs \cdot (Ec6 + Ec5)$

$W2subCh_a = Jas \cdot Ea6 \cdot Ea5 + Gas \cdot (Ea6 + Ea5)$

INVERT DECODED VALUE FOR
SUB-WORD b IF THE WEIGHT OF
SUB-WORD c = 5 AND OR
THE WEIGHT OF
SUB-WORD a = 2

290 b

FIG 21

300

Decode Mux Truth Table Sub WORD c													
Ec4-0	Decode Path Mux Control					Block		Dc5	Dc4	Dc3	Dc2	Dc1	Dc0
	Gcs	Hcs	Fcs	Jcs	Kcs								
10000	1	0	0	0	0	G'		Ec6_+Ec5_	0	0	Ec5_	0	0
01000	1	0	0	0	0	G'		Ec6_+Ec5_	0	0	Ec5_	0	1
00100	1	0	0	0	0	G'		Ec6_+Ec5_	0	0	Ec5_	1	0
00010	1	0	0	0	0	G'		Ec6_+Ec5_	0	0	Ec5_	1	1
11101	0	1	0	0	0	H'		1	1	1	Ec5_	0	0
11011	0	1	0	0	0	H'		1	1	1	Ec5_	0	1
10111	0	1	0	0	0	H'		1	1	1	Ec5_	1	0
01111	0	1	0	0	0	H'		1	1	1	Ec5_	1	1
11000	0	0	1	0	0	F'		Ec5	Ec5	Ec5	Ec5_	0	0
10100	0	0	1	0	0	F'		Ec5	Ec5	Ec5	Ec5_	0	1
01011	0	0	1	0	0	F'		Ec5	Ec5	Ec5	Ec5_	1	0
00111	0	0	1	0	0	F'		Ec5	Ec5	Ec5	Ec5_	1	1
10010	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	0	0	0
10001	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	0	0	1
01100	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	0	1	0
01010	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	0	1	1
01001	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	1	0	0
00110	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	1	0	1
00101	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	1	1	0
00011	0	0	0	1	0	J'		(Ec5 xor Ec6)_	Ec6_ · Ec5	Ec5_	1	1	1
11100	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	0	0	0
11010	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	0	0	1
11001	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	0	1	0
10110	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	0	1	1
10101	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	1	0	0
10011	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	1	0	1
01110	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	1	1	0
01101	0	0	0	0	1	K'		Ec6_+Ec5	Ec6_+Ec5	Ec5_	1	1	1

278c

280c

282c

284c

286c

Post Inversion Logic

Invert Results of sub-word c decode if W2subCh_a = 1

W2subCh_a = Jas·Ea6_·Ea5_ + Gas·(Ea6_ + Ea5_)

INVERT DECODED VALUE FOR
SUB-WORD C IF THE WEIGHT OF
SUB-WORD a = 2

290c

FIGURE 22

(4B / 6L EXAMPLE)

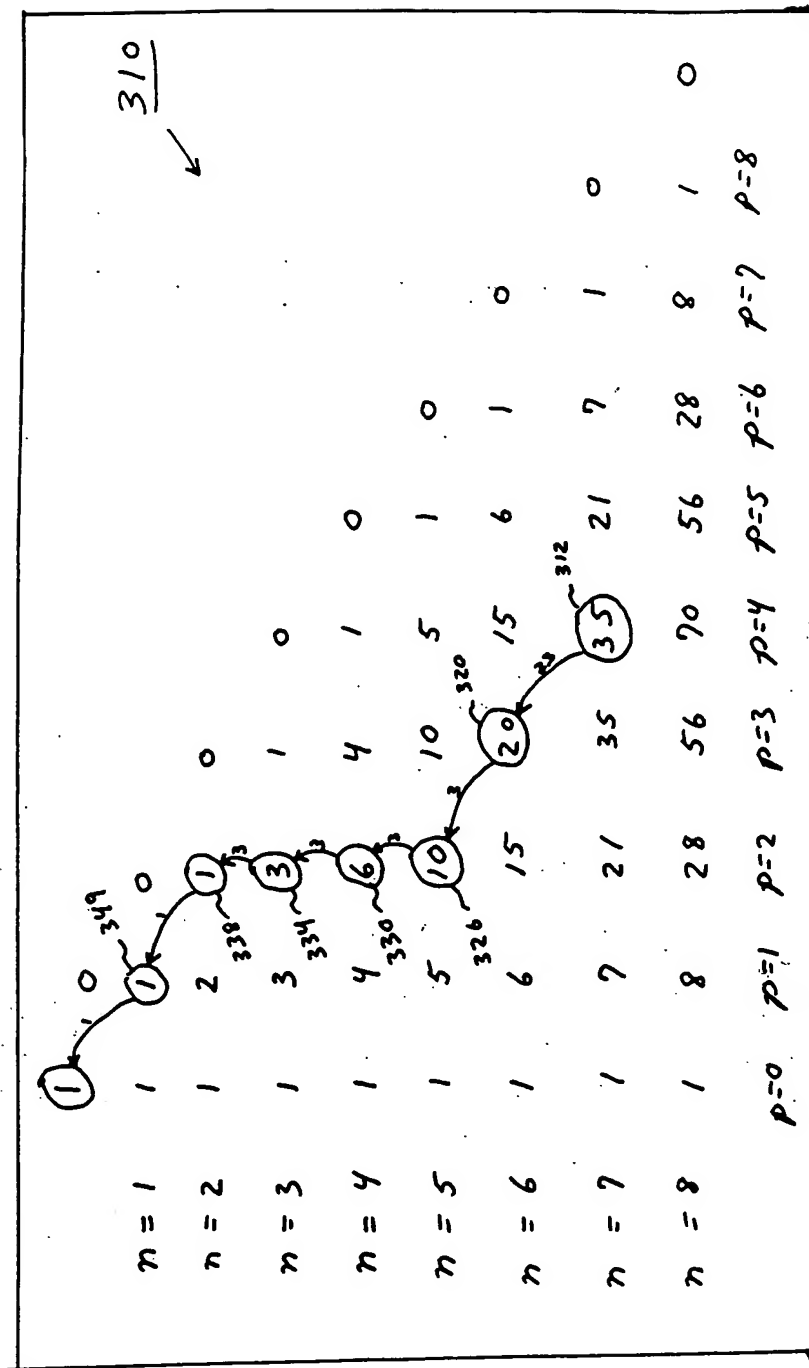
CORRESPONDANCE BETWEEN
DECIMAL, BINARY, AND ENCODED VALUES

302



304 DECIMAL VALUE	306 BINARY VALUE	308 ENCODED VALUE
Decimal Count	Binary Count	Binomial Count
0	0000	000111
1	0001	001011
2	0010	001101
3	0011	001110
4	0100	010011
5	0101	010101
6	0110	010110
7	0111	011001
8	1000	011010
9	1001	011100
10	1010	100011
11	1011	100101
12	1100	100110
13	1101	101001
14	1110	101010
15	1111	101100
16	extra	110001
17	extra	110010
18	extra	110100
19	extra	111000

FIGURE 23



$$\eta_p = \frac{n(n-1)(n-2) \dots n - [p-1]}{1 \cdot 2 \cdot 3 \dots p} \quad \text{--- 310a}$$

$$58\% = 11000110 \quad \text{--- 310b}$$

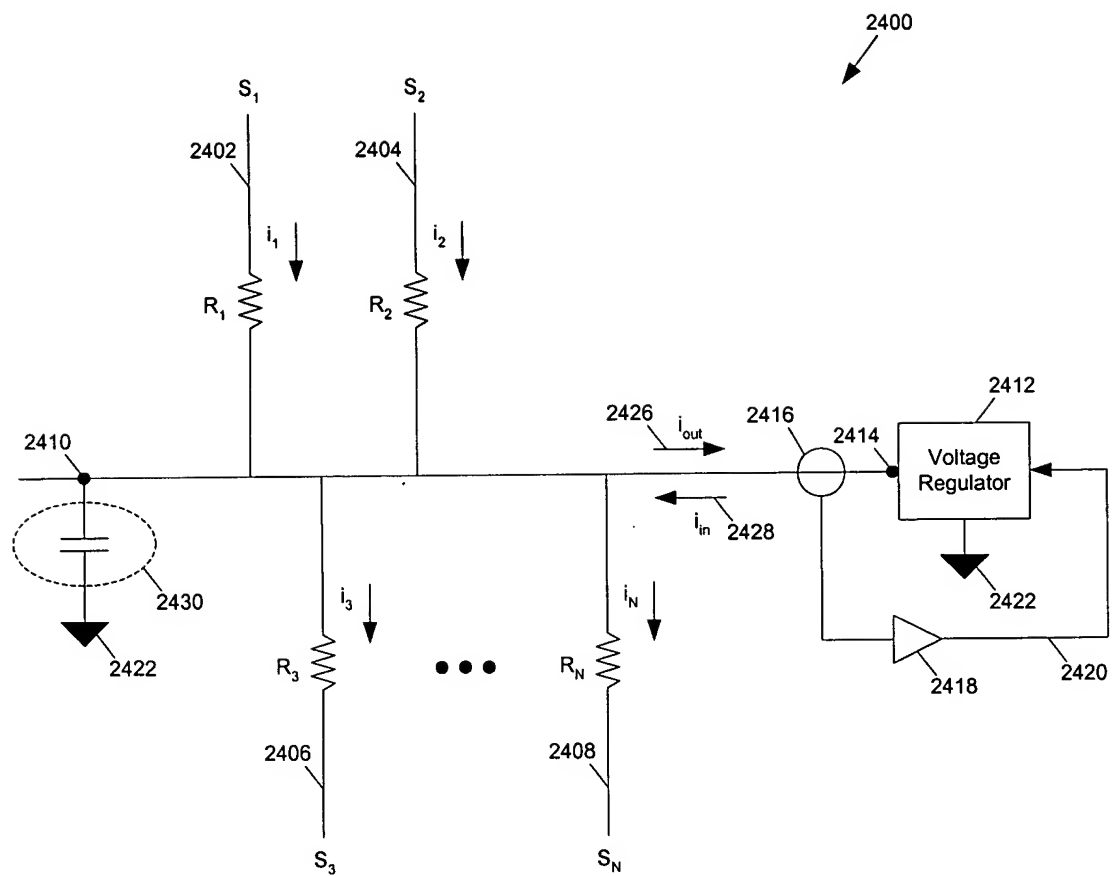


Figure 24

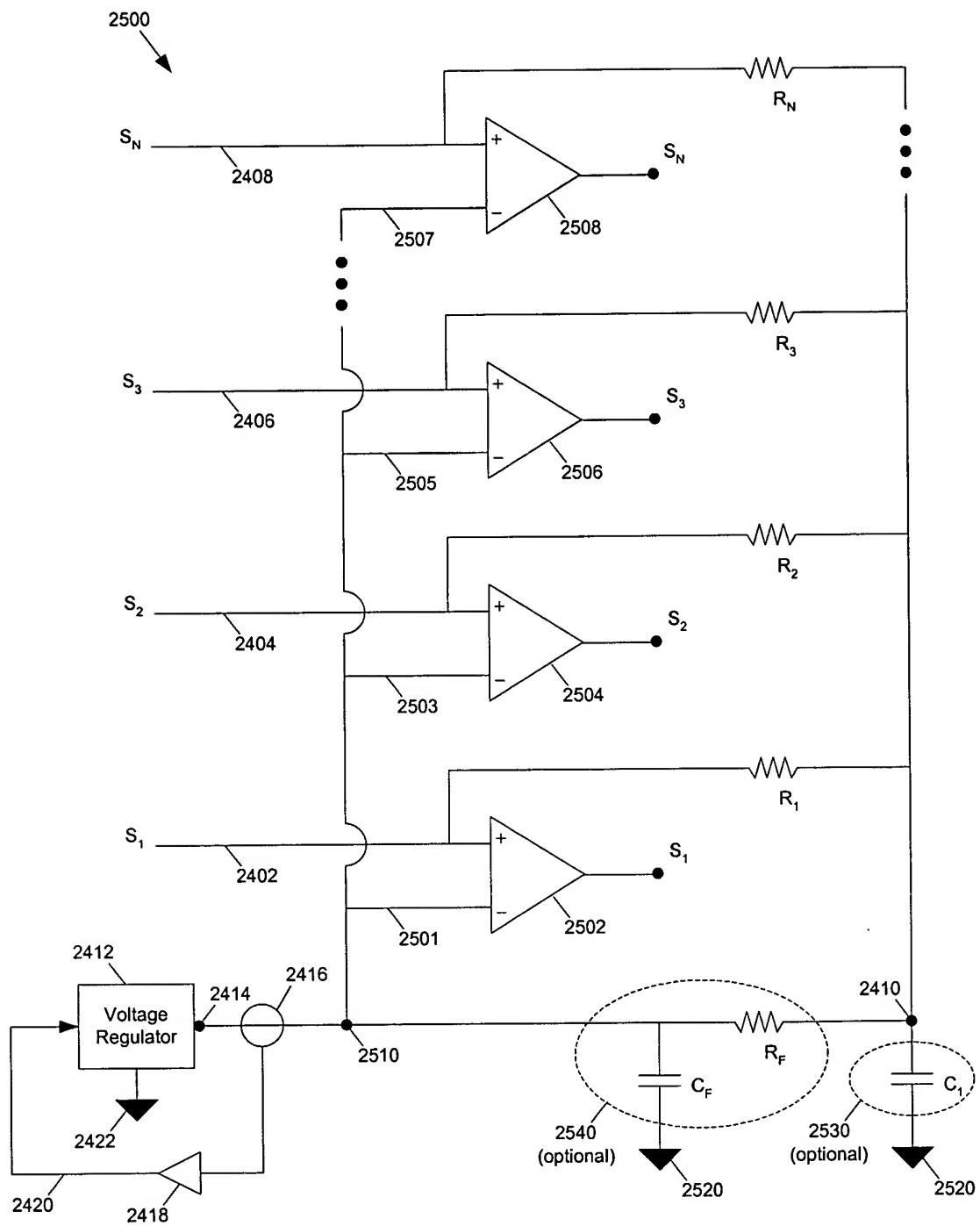


Figure 25

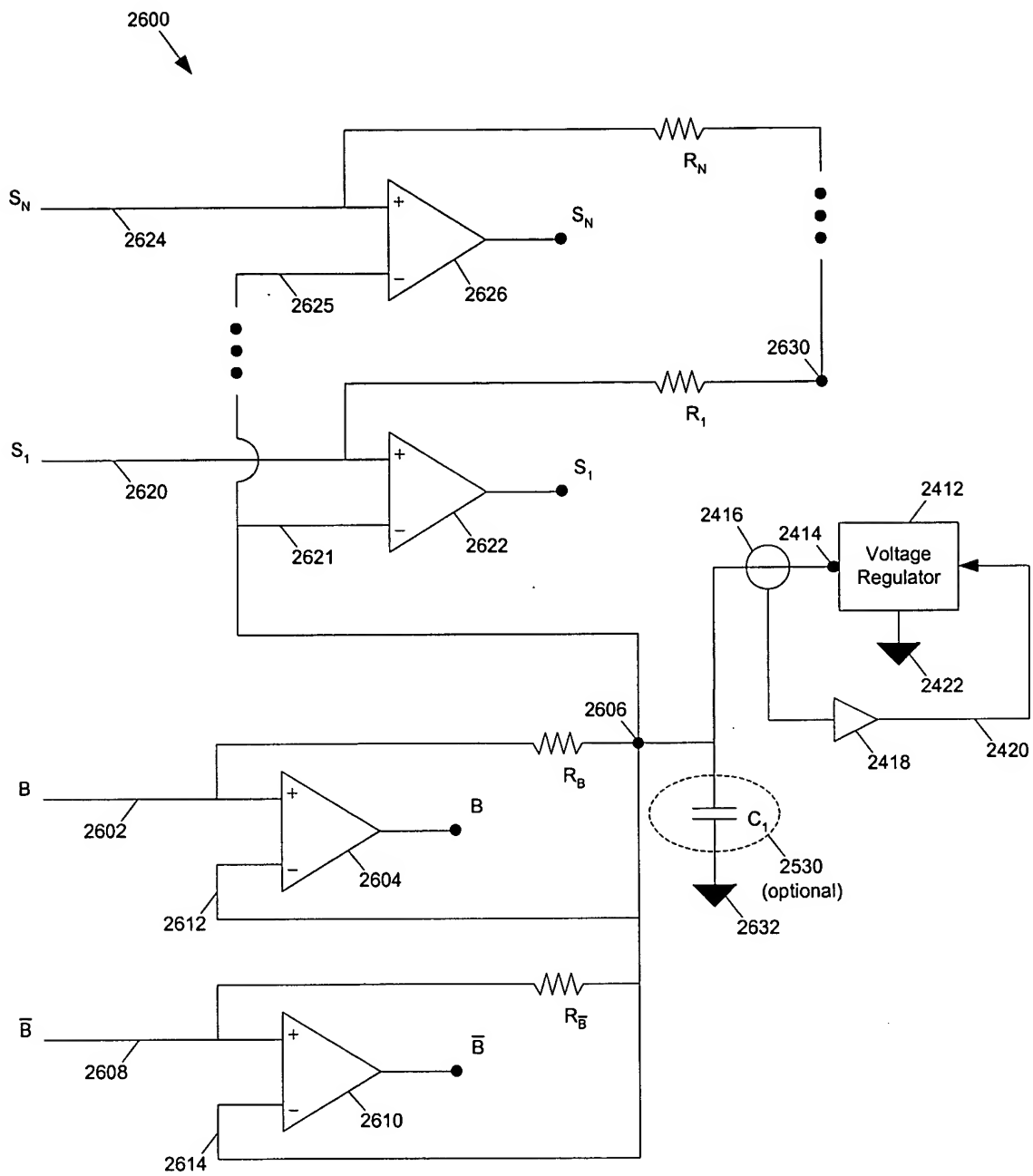


Figure 26

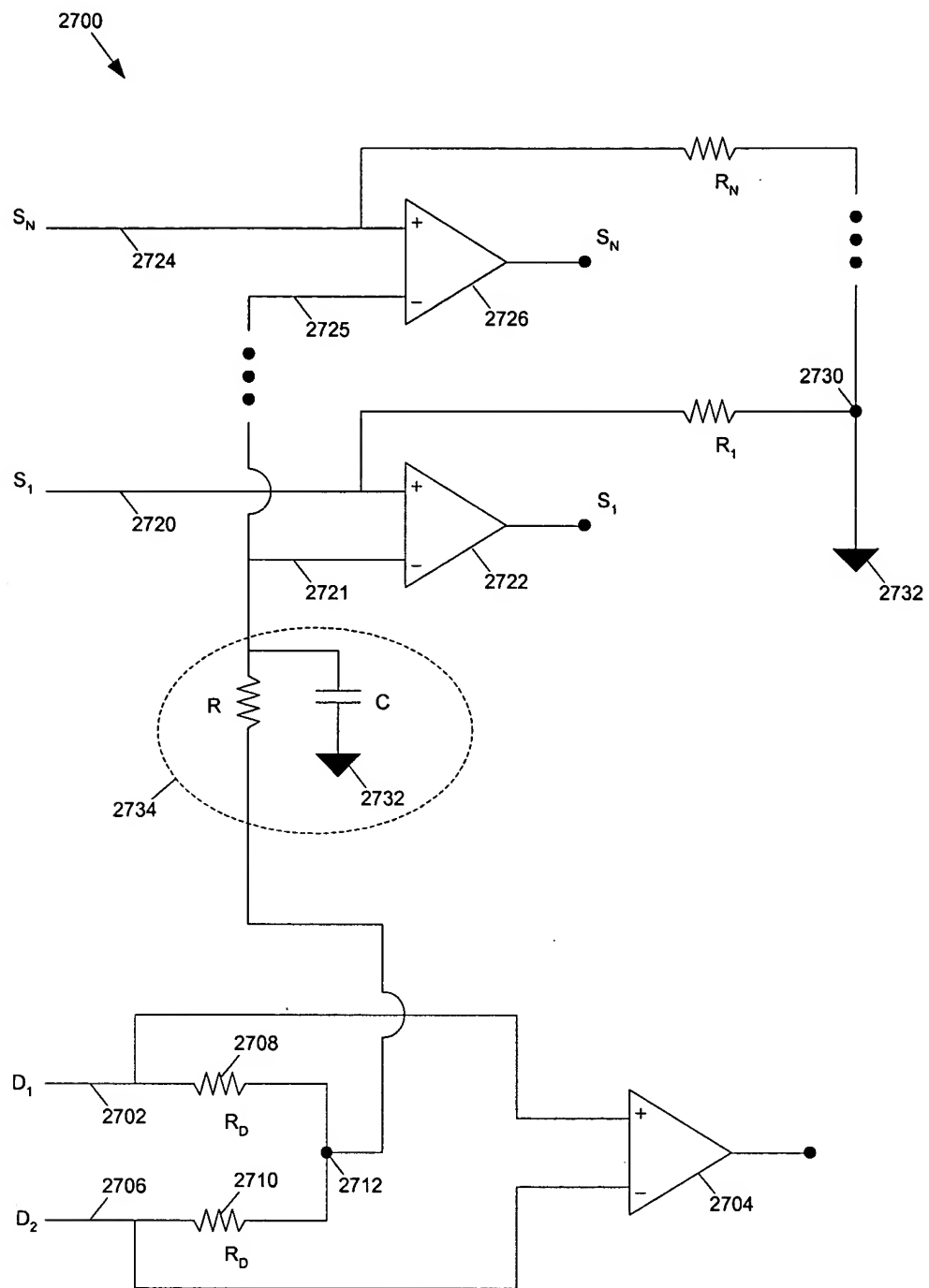


Figure 27

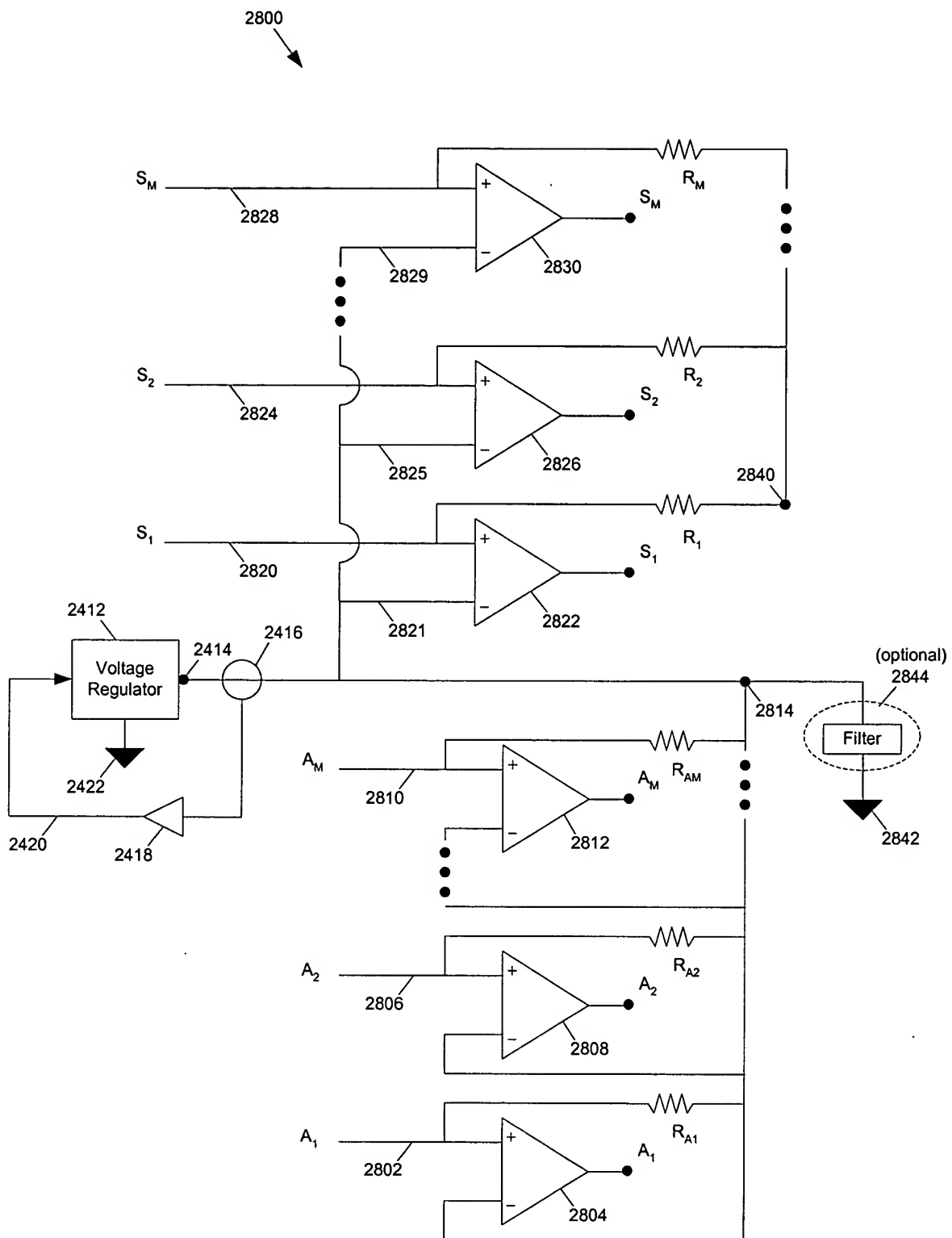


Figure 28